

Hardy Fern Foundation Quarterly



Winter 2016

THE HARDY FERN FOUNDATION

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The Hardy Fern Foundation was founded in 1989 to establish a comprehensive collection of the world's hardy ferns for display, testing, evaluation, public education and introduction to the gardening and horticultural community. Many rare and unusual species, hybrids and varieties are being propagated from spores and tested in selected environments for their different degrees of hardiness and ornamental garden value.

The primary fern display and test garden is located at, and in conjunction with, The Rhododendron Species Botanical Garden at the Weyerhaeuser Corporate Headquarters, in Federal Way, Washington.

Affiliate fern gardens are at the Bainbridge Island Library, Bainbridge Island, Washington; Bellevue Botanical Garden, Bellevue, Washington; Birmingham Botanical Gardens, Birmingham, Alabama; Coastal Maine Botanical Garden, Boothbay, Maine; Dallas Arboretum, Dallas, Texas; Denver Botanic Gardens, Denver, Colorado; Georgia Perimeter College Garden, Decatur, Georgia; Inniswood Metro Gardens, Columbus, Ohio; Lakewold, Tacoma, Washington; Lotusland, Santa Barbara, California; Rotary Gardens, Janesville, Wisconsin; Strybing Arboretum, San Francisco, California; University of California Berkeley Botanical Garden, Berkeley, California; and Whitehall Historic Home and Garden, Louisville, Kentucky.

Hardy Fern Foundation members participate in a spore exchange, receive a quarterly newsletter and have first access to ferns as they are ready for distribution.

Cover design by Willanna Bradner

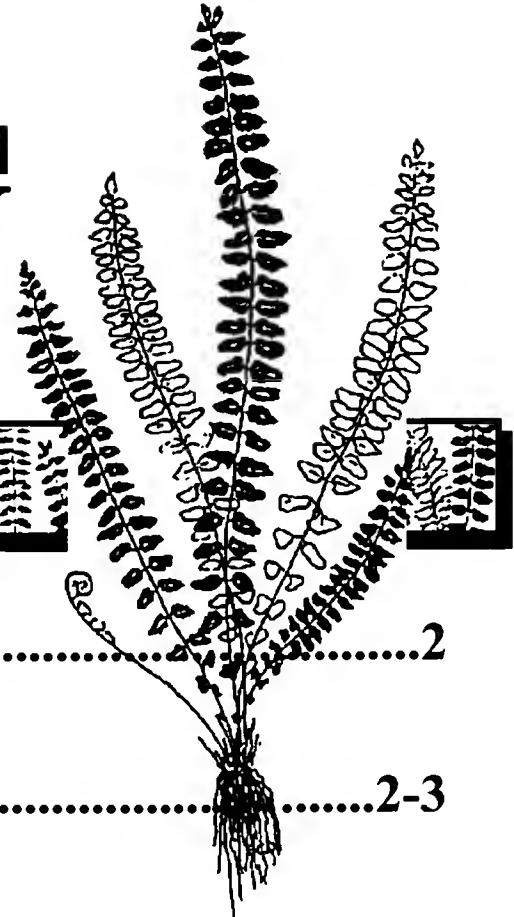
HARDY FERN FOUNDATION QUARTERLY

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Editor- Sue Olsen



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**Visit our educational booth at
the 2016 Northwest Flower and
Garden Show!
February 17th - 21st**

Winter 2016 ~ President's Message

Thank you to everyone who contributed to the HFF annual appeal. With your help, we raised over \$4,000 for the programs and operations of our organization and I appreciate your support! As winter draws in around us the board of the HFF is working on several events for the upcoming year that we hope many of you can attend.

Even in the middle of winter, gardening is not far from my mind. Fortunately, where I live in the mild Pacific Northwest, work can be done any day that the weather permits. I am now in the process of cutting back fronds on many of the evergreen species and cultivars. The first evergreen fern I cut back is one of my favorites *Adiantum venustum*, Himalayan maidenhair. This has been planted as a lawn substitute in a shady section and will start sending up new fronds very early in the year. By removing the fronds so early it will also showcase the early spring ephemerals scattered through the planting. Already I have noticed snowdrops poking up through the soil!

Maidenhairs are one of the most beautiful of our hardy ferns and it is to my delight to share information in this issue about a new *Adiantum* discovered in northern California. Along with the official description of this new species I offer my account of going to its native region to see it in person. I am even more pleased to have Ed Alverson, one of people responsible for the naming of this new species to speak at this year's annual member's meeting held during Fern Fest in early June. Keep an eye out for more information on this event later in spring.

For those where the winter is a bit harsher, it is a great time to think about sowing spore. The new HFF spore list is now here in this issue and on line. Growing from spore is a great way to acquire new and rare ferns, share ferns with friends, as well as fill a little time until the ground thaws. Try to visit us at the Northwest Flower & Garden Show February 17-21 at the Washington State Convention Center in downtown Seattle.

All the best,

Richie Steffen
HFF President

***Polypodium hesperium*, Western polypody**

James R. Horrocks ~ Salt Lake City, UT

The genus name refers to the numerous nodulose protuberances on the long-creeping, branching rhizomes which suggest the translation “many-footed”. (See “footnotes” or consult a podiatrist) The species name *hesperium* means “western” or “evening”, it being mostly a western North American native found in the Pacific Northwest from British Columbia down through the Sierras to southern California and Mexico and eastward to Utah and south to Arizona and New Mexico. It is disjunct in Wyoming, Colorado and South Dakota. An interesting side note: *Polystichum munitum*, another western native, also has a disjunct population in South Dakota.

Polypodium hesperium is the fertile tetraploid hybrid between *P. amorphum* and *P. glycyrrhiza*, being a bit taller than the former but shorter than the latter. *P. hesperium* has back-crossed with the two parent plants, which are both diploids, to produce intriguing triploid hybrids known only from a few localities in British Columbia. (see photo page 12) It is also closely related to *P. californicum* which has also hybridized with *P. glycyrrhiza*. Are we confused yet? There are published accounts of this interesting “hesperium complex” by Lang (1971) and Lloyd (1975). (See Bibliography- Lellinger) Western polypody is epipetric under cliff faces, in talus, and in soil under rocks and ledges, usually preferring lime-free sites. In the author’s home state of Utah, it is frequent in the high mountains, found in shaded ravines and canyons, ranging even southward into Zion National Park.

Description: The western polypody is a small fern with medium to long-creeping and branching rhizomes that are densely covered in brown broadly lanceolate scales. As mentioned, the rhizomes are adorned with many nodular protuberances and have a bitter-sweet taste. The stipes are described variously as beige to yellowish to green, except at the extreme base where they are often brown. They are about one-fourth to one-third the length of the frond, occasionally bearing light brown scales. The entire frond can be from 4 to 15 inches long, being barely widest at mid-frond and described as oblong-ovate to oblong lanceolate in outline. Hoshizaki describes them as pinnatiflobed. The dark evergreen fronds are deeply pinnatifid to nearly once-pinnate, truncate at the base, with 12 to 18 pairs of “chubby” pinnae that are rounded at the tips. The frond terminates abruptly to a small acute point. The rachises are smooth above but below bear linear-lanceolate scales. The young sori are oval and borne between the serrate to nearly entire margins and the mid-vein. The sori lack both indusia and paraphyses and become rounded with age.

Culture: Here again we have a fern that is an interesting discovery in the shaded ravines of alpine areas but is best left there as it is atrociously difficult to cultivate. It is easily confused with its aforementioned parents and with other *Polypodium* species of the Pacific Northwest. In Utah, it is the only *Polypodium*, making identification a no-brainer. A few very determined gardeners have claimed to have successfully cultivated it but how long it lasted is the question. Most authorities agree that it is difficult even under the best of condition. If you insist on trying it, use a slightly acidic soil mixture and follow F. Gordon Foster’s directions to “Simulate a natural environment by building elevated rock ledges.” It will “do best in partial sunlight to open light. Avoid deep shade.” The author has attempted it only once with disappointing results and is now content to take the 20 minute drive up one of the Cottonwood Canyons to its natural habitat.

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A New Fern in Northern California

Richie Steffen

Federal Way, WA

In late 2014 rumors circulated of a new fern discovered in Northern California in the well-botanized Shasta Lake region. Knowing that this was a popular tourist destination I suspected this new fern was going to be a small, difficult-to-grow species with little prospect of becoming more than a collector's plant with no landscape value. Surprisingly, I was very wrong! A few small plants were distributed to the Hardy Fern Foundation and specialty fern growers to begin evaluations on cultivation and propagation from spores to protect wild populations.

Over the next several months few of us heard much about these trial plants and even fewer had seen these young novelties. As the first winter in cultivation drew to a close word started to seep out that this new fern seemed to be hardy, evergreen and cultivatable! In its native habitat searches were made to assess populations and the need for conservation status. Amazingly, it was found to be locally abundant. As the mystery of this fern unraveled it was announced in early 2015 that the new fern was an *Adiantum* and named for the region where it was found, *Adiantum shastense*, Shasta maidenhair. With little more information than this a small group of plant geeks set out to see if they could find it in the wild. The group consisted of myself, my partner, Rick Peterson, and Paul Bonine, of Portland, Oregon. (see photo pg. 13)

Setting aside a long weekend at the end of April we embarked on our trip. After an 11 hour drive we arrived in Redding, California. Near Redding is Shasta Lake, Shasta Mountain and the Trinity Mountain area, all incredibly rich in diverse flora and simply beautiful in spring. The winter had been unusually warm and dry and high temperatures were already being experienced by much of California. The day we arrived the temperature was already in the high 80's.

After a restful night's sleep we drove off toward Shasta Lake one of the sites for this mystery fern. Unsure of what to expect we kept a sharp eye out for anything ferny. After a 30 minute drive we turned onto a gravel road where the fern was known to occur. The road ran through an evergreen forest composed primarily of oaks and Douglas fir. To our surprise roughly 100 yards into our bumpy drive we found our first population of this new maidenhair. Hundreds of well established plants covered steep, heavily wooded slopes. Lush bright green fresh fronds were fully expanded with immature sori beginning to develop. Old evergreen fronds formed a tattered skirt below, waiting to be covered by new growth. The ferns gracefully cascaded down the slope to the road weaving between evergreen oak and Douglas fir trunks. A few *Polystichum lonchitis* and *Dryopteris expansa* invaded the group with a handful of beautifully marbled leaves of the wild ginger, *Asarum hartwegii*. This was a great beginning to the trip.

As we continued along the road we encountered drier, more open areas with drifts of sky blue to indigo *Ceanothus* under the shade of distinctively "Y" shaded wispy *Pinus sabiniana*, gray pine or ghost pine. These long needled pines clutch their formidable large, spiky cones high in the tree waiting for a strong storm to break their grip to send these seed-laden bombs plummeting to the ground with a thud. Wild flowers dotted the

landscape with several native bulbs in bloom from the delightful *Calochortus tolmiei*, called cat's ears, to the swaying blooms of *Dichelostemma multiflorum*, summer hyacinth.

The next day we explored the dry mountains near Whiskey Lake, west of Shasta Lake. There were few ferns to be found, but the star of the day was the shrubby *Styrax redivivus*, California snowbell. A lovely 4 to 6 foot tall shrub with gleaming white bell-shaped flowers with golden anthers in the center of the bloom. This charming shrub was abundant on the hills and near full bloom. A few open, but shaded banks had clusters of *Pityrogramma triangularis*, goldback fern, growing on road cuts with the chalky white *Sedum spathulifolium*, a common stonecrop of the West Coast. One sunny rock outcropping had a vigorous colony of *Pellaea andromedifolia*, the coffee fern. An impossible fern to grow well in the Pacific Northwest, it is always a welcome sight in its native habitat. (see photos pg. 13)

Leaving Whiskey Lake, we explored the northern end of Shasta Lake. The lake was already low from prior years' droughts and a prominent band of orangey red soil could be seen circling the lake, delineating where the shoreline should begin. Evergreen oaks and Douglas firs dominated the forests once again and in several shady, sloped areas we found Shasta maidenhair and, nearly always with it, the lovely mottled leaves of wild Hartweg's wild ginger. A particular treat was to find clumps of the California endemic *Iris tenuissima*, the longtube iris, in full flower along with the first flowers of Western allspice, *Calycanthus occidentalis*, with their distinctive wine-like fragrance. (see photo pg. 13)

Returning to our car we began our journey home from an extremely successful and enjoyable trip.

***Adiantum shastense*, a new species of maidenhair fern from California**

RESEARCH ARTICLE

A peer-reviewed open-access journal

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Launched to accelerate biodiversity research

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Abstract

A new species of *Adiantum* is described from California. This species is endemic to northern California and is currently known only from Shasta County. We describe its discovery after first being collected over a century ago and distinguish it from *A. jordanii* and *A. capillus-veneris*. It is evergreen and is sometimes, but not always, associated with limestone. The range of *Adiantum shastense* Huiet & A.R.Sm., sp. nov., is similar to several other Shasta County endemics that occur in the mesic forests of the Eastern Klamath Range, close to Shasta Lake, on limestone and metasedimentary substrates.

Keywords

Shasta Lake, maidenhair, Shasta snow wreath, new species

Introduction

The genus *Adiantum* L. (Pteridaceae) is found worldwide mostly in the tropics and subtropics, but about ten percent of species (of a total of ca. 225 spp.) are found in temperate regions. The majority of these occur in Asia but several are found in North America. There are nine species of *Adiantum* in the continental United States and Canada and eight of the nine are native (Paris 1993). Three are of tropical origin, occurring in restricted ranges that are at their northern most limits. The remaining five species occur solely in temperate regions, with four having a broad geographic range: *Adiantum pedatum* L., *A. capillus-veneris* L., *A. aleuticum* (Rupr.) C.A.Paris and *A. jordanii* Müll. Hal. *Adiantum pedatum* and *A. capillus-veneris* are distributed beyond North America (Paris 1993); *A. capillus-veneris* is the most wide-ranging and occurs on six continents, whereas *A. pedatum* occurs widely in both North America and Asia. Cytological data for different geographic localities of these two species reveal differing chromosome numbers (diploids, tetraploids, dysploids), suggesting that they may both be species complexes (Löve and Löve 1997, Nakato and Kato 2005, Wagner 1963).

Of the four wide-ranging species, three *Adiantum capillus-veneris*, *A. aleuticum* and *A. jordanii* occur in California and none of these is endemic. They all are found in at least 30% of the counties, and their distributions span the entire state. *Adiantum aleuticum* is easily recognized by its distinct pseudopedeate laminar morphology, while *A. jordanii* has a laminar architecture that is more similar to *A. capillus-veneris*; however, the two are not closely related (Huiet et al. unpublished). Juvenile and sterile forms of these taxa can sometimes be difficult to distinguish.

While investigating *Adiantum capillus-veneris* populations in California as part of a worldwide molecular phylogenetic study of the genus, a new endemic species was discovered. Here we describe this new taxon and discuss its remarkable discovery after it was first collected over 100 years ago.

Methods

Chromosome material of young sporangia was field-fixed in ethyl alcohol:acetic acid (3:1). Spore mother cells were stained with acetocarmine, and, using standard squash

techniques, examined under a compound microscope. Meiotic cells were examined at diakinesis, metaphase I, and normal pairing of homologous chromatids was seen. The voucher is listed under paratypes.

Taxonomy

Adiantum shastense Huiet & A.R.Sm., sp. nov.

urn:lsid:ipni.org:names:77148382-1

Figs 1–2

Diagnosis

Adiantum shastense is similar to *A. jordanii* in having dark brown to purplish brown rhizome scales and 2–3-pinnate laminae. It differs by being persistent and green throughout the summer, and does not die back as does *A. jordanii*. *Adiantum shastense* can be distinguished from *A. capillus-veneris* by the darker rhizome scales, the rhomboid shape of the pinnulets, and the often, glaucous bluish green color of the laminae.

Type

UNITED STATES, California: Shasta County, north side of Lake Shasta. McCloud River arm, along Gilman Road, just W of intersection with Old Mill Road where Fall Creek intersects Gilman Road. 40°51.517200'N, 122°18.835800'W, 1222 ft, 14 May 2014, Layne Huiet, Alan Smith, Joan Smith, Ellen Dean & Martin Lenz 162 (holotype: UC2030515!; isotypes: CAS!, DAV!, DUKE!, MO!, NY!, US!)

Description

Rhizomes short-creeping or ascending, usually buried in loose soil, 2–4 mm in diameter, sometime branching; stipes clustered, up to 10 fronds per 1 cm of rhizome length; rhizome scales (and those at stipe base) castaneous to dark brown, lustrous, concolorous, ovate to lanceolate, attenuate at tips, 1.5–5 × 0.3–0.6 mm, margins entire; fronds clustered, mostly (18–)30–60 cm long, arching, persisting (remaining green) through summer, fall, and into winter; older dead fronds remaining attached to rhizome behind new growth; stipes castaneous to atropurpureous, becoming blackish with age, sublustrous, sometimes slightly glaucous (especially proximally), terete, each with a single vascular bundle at bases, (10–)20–30 cm long, (0.6–)0.8–2.0 mm in diameter, ca. 1/2 the frond length, glabrous except at very bases; laminae ovate to deltate, 2–3 times pinnate (depending on size), mostly (12–)20–35 × (6–)15–20 cm, broadest at or just above the bases, tapering gradually to apices, costae (pinna axes) ascending mostly 30–50 degrees from rachis, pinnae acroscopically branched, basal acroscopic pinnule longer, more dissected, and at a greater angle with respect to costa than basal basiscopic branch (pinnae thus somewhat unequal-sided), laminae bluish green, often slightly glaucous; rachises castaneous to atropurpureous, glabrous, lustrous or slightly glaucous, terete to somewhat angled or obscurely sulcate adaxially (more so distally); pinnae of well developed laminae ca. 6–8 pinnate to bipinnate pairs below the 1-pinnate apical region (which is 3–5 cm long), decidedly alternate, stalked to ca. 2 cm (proximal pinnae); pinnulets (ultimate segments) obovate, flabellate, or rhombic, sometimes semicircular, non-articulate except on very old laminae (stalks not breaking cleanly, not cupule-like at their apex), mostly 1–2 × 1–2 cm (to 2 × 3 cm in sterile segments of juvenile fronds), cuneate at bases ca. 90–135 degrees (more narrowly cuneate bases on distal segments), occasionally pinnulet bases

truncate and the pinnulets thus semicircular (especially proximal acroscopic pinnulet on well-developed pinnae), margins often cleft 1–4 mm, sterile pinnulets generally more incised than the fertile, 1–3 clefts per pinnulet, sterile margins thickened, whitish, shallowly crenulate distally, color of stalks gradually diminishing at base of pinnulets and passing slightly into pinnulet lamina; veins free, forking, in sterile laminae ending in small rounded crenulations (not in sharp teeth) of pinnulet margins, usually visible but only slightly raised, if at all, on both sides of laminae; indument lacking on both sides of laminae; idioblasts not apparent either abaxially or adaxially; sori 2–7 per pinnulet, confined to distal margins, sporangia borne on ± parallel veins on the strongly reflexed underside of the indusia (facing laminar tissue), mixed with sessile yellow-orange, cylindrical or clavate glands < 0.1 mm long; indusia mostly (1–)2–4 mm long, ca. 1 mm wide, entire or nearly so, oblong to slightly arcuate (not noticeably reniform), lacking hairs. $2n = 30$ II.

Distribution and ecology

Adiantum shastense is currently known only from an area of the Eastern Klamath range (Miles and Goudy 1997) surrounding Shasta Lake entirely within Shasta County, California. It is found in mesic hardwood-conifer forests, on the forest floor as well as on limestone and metasedimentary rock outcrops, including rocky road cuts, most often in shade and with northern or eastern exposures. It co-occurs with the local endemic Shasta snow wreath, *Neviusia cliftonii* Shevock, Ertter & D.W.Taylor. In some localities it can be the dominant understory plant (Fig. 1a). Associated species include *Pinus ponderosa* P.Lawson & C.Lawson, *Quercus chrysolepis* Liebm., *Acer macrophyllum* Pursh, and *Toxicodendron diversilobum* (Torr. & A.Gray) Greene. Collected from 1100–2740 ft (335–835 m) elevation.

Phenology - Sporulates mid to late spring and most likely throughout summer.

Etymology - It seems most appropriate to name this species *Adiantum shastense*, recognizing its restricted, currently known geographic localization to Shasta Co., California.

Suggested common name -
Shasta maidenhair fern.

Conservation status - We recommend a California Rare Plant Rank of 4.3, a watch list for plants of limited distribution.



Figure 2. Holotype of *Adiantum shastense* Huiet & A.R. Sm. (Huiet et al. 162, UC)

Paratypes

U.S.A. California: Shasta Co.: 2.6 miles E of Nosoni Mountain on the west side of North Fork Squaw Creek, 2700 ft, 07 Apr 2009, P.J. Alexander 994 (DUKE!, NMC, SP); Waters Gulch Trail ca. 05 mi N of Packers Bay Marina, 1200 ft, 27 Apr 1994, *Oswald & Ahart* 6148 (CHSC, JEPS!); Bailey Cove Trail, W side of McCloud River arm of Shasta Lake, 1100 ft, 27 Apr 1994, *Oswald & Ahart* 6121 (CHSC, JEPS!); Oak Run, 21 May 1894, *Baker & Nutting s.n.* (UC!); on limestone cliffs 0.5 mi E of Squaw Creek fire control station, 1750 ft, 19 Apr 1992, *Taylor* 12599 (JEPS!); south side of Lake Shasta, Pit River Drainage along Fenders Ferry Rd, 1730 ft, 15 May 2014, *Huiet et al.* 167 (DAV!, DUKE!, UC!); on arm of McCloud Reservoir across from boat ramp, ca. 8.5 air miles SSE of McCloud, 2740 ft, 27 May 2014, *Lenz & Nelson* 5350 (DUKE!, UC!); along road to Deep Creek campground, ca. 5.2 air miles SE of Big Bend, 2395 ft, 27 May 2014, *Lenz & Nelson* 5351 (DUKE!, UC!); along logging road on east side of Sacramento River across from Gibson, 2045 ft, 27 May 2014, *Lenz* 5352 (DUKE!, UC!); McCandless Gulch ca. 5 miles E of Ingot, 1700 ft, 16 Sept 2014, *Taylor, Falscheer & Lindstrand* 21512 (DAV!, UC!); Cedar Creek drainage, ca. 6 miles west of Round Mountain on Highway 299, 1450 ft, 6 Sept 2013, *Taylor* 21418 (UC!); along Fender's Ferry Rd. ca. 6.5 road miles SE of McCloud Bridge, 1800 ft, 3 Jul 2014, *Alverson* 2014-10 (OSC, UBC, WTC!); north side of Lake Shasta, McCloud River Arm, Bailey Cove Trail, 1135 ft, *Huiet et al.* 156A (DUKE! chromosome voucher).

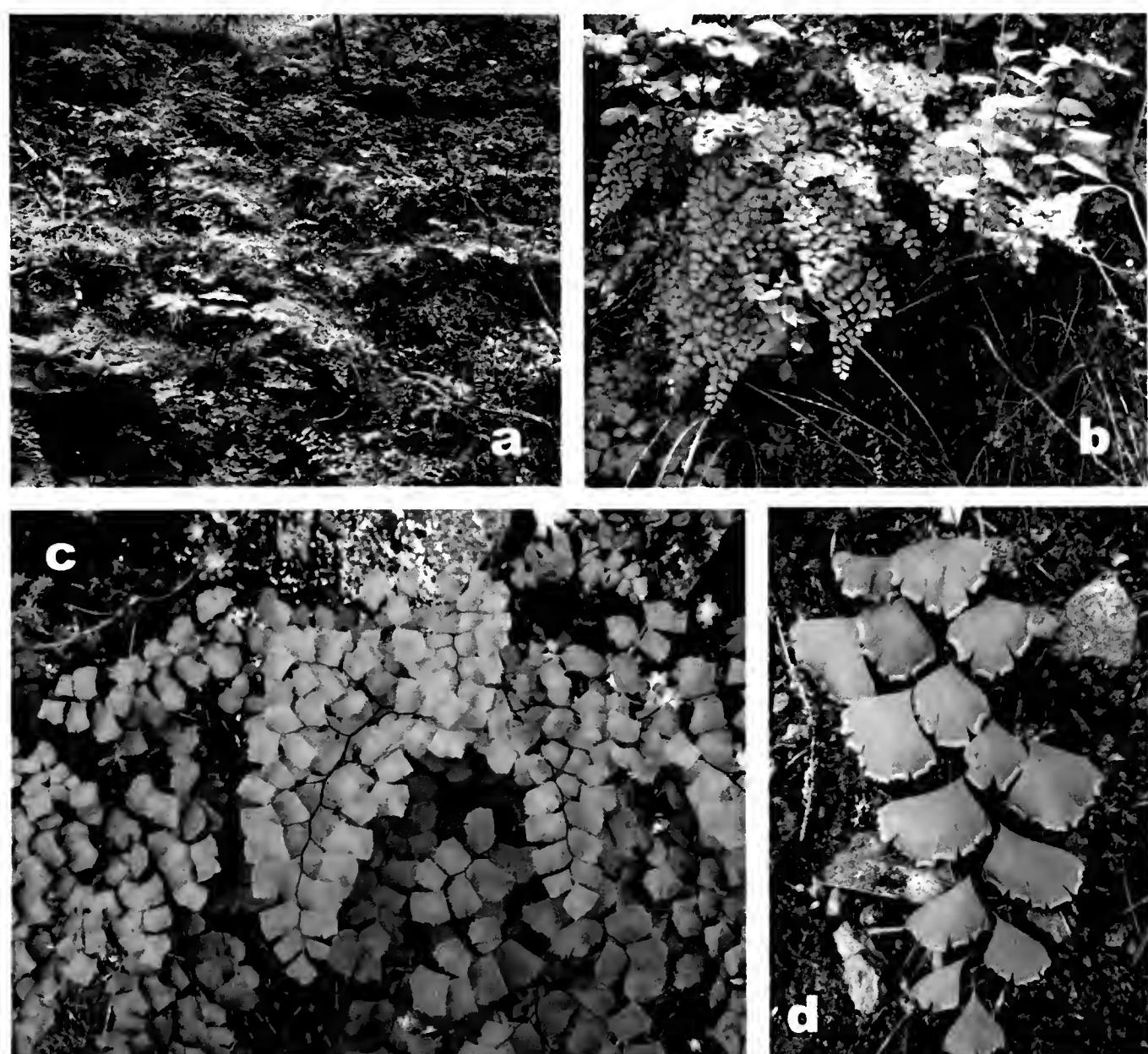


Figure 1. Photographs of *Adiantum shastense*. A. Plants dominant understory in one locality. B. Mature plant C. Fronds D. Young fertile pinnulets.

Discussion

It was a surprise to discover that amongst the few herbarium collections of *Adiantum* from Shasta County, there was a previously unrecognized species. Before 2014, there were only 13 documented collections of *Adiantum* in the county (data from participants of the Consortium of California Herbaria, <http://ucjeps.berkeley.edu/consortium>). Amongst them were all the recognized taxa in California: *A. aleuticum*, *A. capillus-veneris*, and *A. jordanii*. It was while confirming the identity of a recent collection that we serendipitously stumbled upon the new species. DNA sequencing analysis revealed that this plant was neither *A. capillus-veneris* nor *A. jordanii*, but rather sister to *A. jordanii*. We confirmed that additional specimens collected near Shasta Lake gave the identical result (Huiet et al. unpublished). Subsequently, in spring 2014, we made collections from additional populations across a wider geographic range to confirm the earlier results and to examine material in the field.

Morphologically *Adiantum shastense* has rhizome scales that are essentially the same as in typical *A. jordanii*. However the pinnulets of *A. jordanii* are more fan-shaped and usually the sorus length is much longer so there are fewer sori per pinnulet than in *A. shastense*. No doubt because of the shorter sorus length and the more cuneate shape to the pinnulets, *A. shastense* has been identified by some as *A. capillus-veneris*, the only other species found in California with similar blade architecture. However, the sori of *A. shastense* have yellow farina among the sporangia, as does *A. jordanii*. Also, the rhizome scales of *A. capillus-veneris* are golden or lighter brown than those of *A. shastense*. The most striking difference between *A. shastense* and *A. jordanii* is that *A. shastense* is not ephemeral. Green laminae are persistent throughout the summer, and the fronds appear to overwinter without dying back, perhaps until more than a year's persistence. After the fronds die back, they ring the base of the plant, surrounding the new growth.

The first collection of *Adiantum shastense* in Shasta County was over a century ago by Milo Baker and Frank Nutting, in 1894, and was identified by Baker as *A. jordanii*. No other collection was made of *A. shastense* until 1992 (Taylor 12599, UC) and that was identified as *A. capillus-veneris*. Subsequent collections were mostly identified as *A. capillus-veneris*. Thus far, the distribution of *A. shastense* appears to be limited to a region surrounding Shasta Lake and the rivers and watersheds that feed into it and their drainages. A survey of other specimens identified as *A. jordanii* and *A. capillus-veneris* from nearby areas (counties) did not reveal any additional collections of *A. shastense*. This includes a single collection of *A. capillus-veneris* from Siskiyou county (UC), collected in a cave at Lava Beds National Monument (Smith et al. 1993). We also have examined specimens of *A. jordanii* from Oregon and they too are correctly identified.

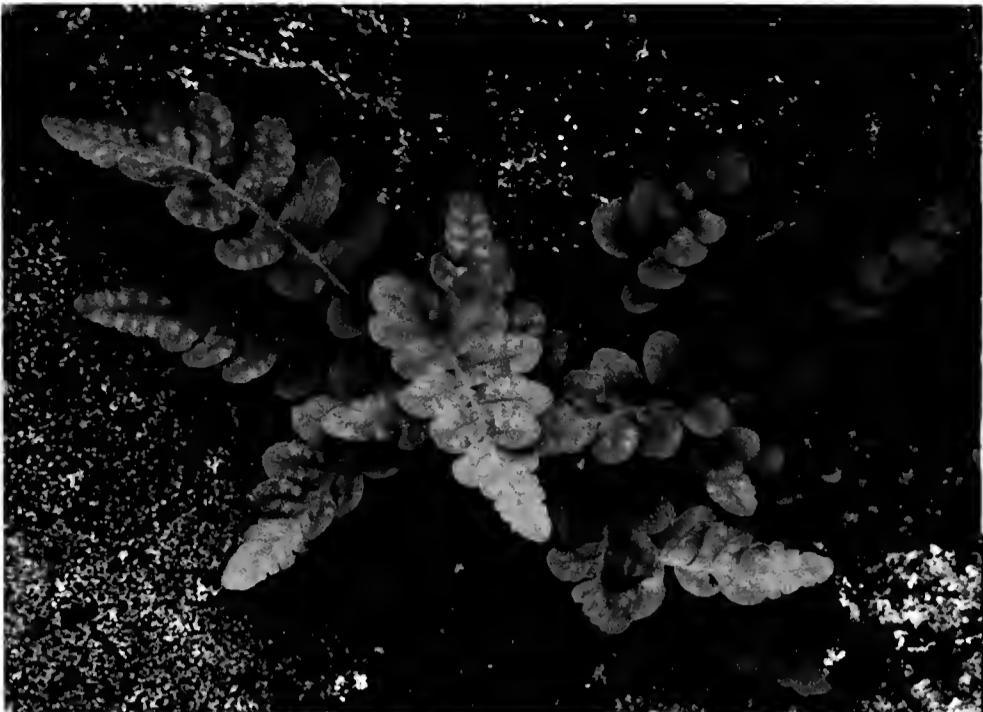
It appears that the Shasta maidenhair fern is another narrow endemic found in the area surrounding Shasta Lake. This region is host to a number of endemic plants and animals, most likely because of its unique geology, age and climate. These include the Shasta salamander, *Hydromantes shastae* Gorman & Camp, 1953 (Hammerson et al. 2004); the Shasta monkey flower, *Erythranthe taylori* Nesom (Nesom 2013); Shasta snow wreath, *Neviusia cliftonii* (Lindstrand and Nelson 2006); and the Shasta eupatory, *Ageratina shastensis* (D.W.Taylor & Stebbins) R.M.King & H.Rob. (Taylor and Stebbins 1993). Of these species, the Shasta maidenhair fern has one of the widest geographic ranges, perhaps due to its wind-borne spores. Currently we do not know if its range extends beyond the geologically unique Shasta Lake region into neighboring counties. Further

field study may reveal more about this surprisingly new and unique California maidenhair fern. It currently is the only endemic species of *Adiantum* in the United States.

Key to species of *Adiantum* in California

- 1 Rhizomes stout, compact, short-creeping to suberect, usually 5–8 mm diam. (scales excluded); stipes mostly 1.5–3 mm diam. at bases; laminae palmate-pinnate (fan-shaped), proximal pinna pair 2–3-times basiscopically forked; pinnulets strongly inequilateral, 2–4 times longer than wide..... *A. aleuticum*
- Rhizomes relatively narrow, short- to long-creeping (occasionally more compact in *A. shastense*), usually 1.5–3 mm diam (scales excluded); stipes mostly 0.5–1.5 mm diam. at bases; laminae 2–3-pinnate (not fan-shaped), proximal pinna pair 0–1 times basiscopically forked; pinnulets more or less equilateral (bilaterally symmetric), about as long as wide or sometimes to twice as long as wide in *A. capillus-veneris*.
 - 2 Rhizome and stipe base scales golden brown or light brown; laminae usually 2-pinnate; pinnulets (especially sterile ultimate segments) cut or lobed often >1/4 or much more than (to 2/3) the way to base; dark color of stalks extending into base of ultimate segments; distal teeth of sterile segments usually >3 mm long, acute at tips; pinnulet margins at base diverging at 45–90°; sori (and false indusia) (2–)3–11 per pinnulet, generally < 5 mm long..... *A. capillus-veneris*
 - Rhizome and stipe base scales dark brown or dark purplish brown; laminae 2–3-pinnate, larger fronds with proximal pinnae usually having at least 1 or 2 pairs of pinnules divided (i.e., laminae 3-pinnate proximally); pinnulets (especially sterile ultimate segments) cut or lobed usually <1/4 of the way to base; dark color of stalks extending into base of ultimate segments or ending ± abruptly at base of ultimate segments; distal teeth of sterile segments 1–2(–3) mm long, rounded or acute at tips; pinnulet margins at base diverging at 90–180(–240)°; sori (and false indusia) 1–5 per pinnulet, some generally > 5 mm long.
- 3 Rhizomes short-to long-creeping, just below soil surface, stipe bases often > 5 mm apart; lamina tissue green; dark color of stalks ending ± abruptly at base of ultimate segments; ultimate segments often somewhat semi-lunate; mature fronds dying in late spring or early summer, completely dried and largely unseen in late summer, fall, and early winter; throughout California, but apparently rare in Shasta Co..... *A. jordanii*
- Rhizomes short-creeping to suberect, often deeply buried, stipe bases < 5 mm apart; laminar tissue bluish green; dark color of stalks extending into base of ultimate segments; ultimate segments often somewhat rhomboidal; mature fronds persistent and evergreen through summer and into winter and following spring; Shasta Co., locally abundant..... *A. shastense*

Note: a combination of characters must occasionally be used to separate *Adiantum capillus-veneris*, *A. jordanii*, and *A. shastense*, i.e., not all characters are reliable for all specimens seen. However, the species characters for separating these three species are reliable for 95% or more of specimens seen. For example, Gross 2802 (UC), from Ventura Co., is undeniably *A. capillus-veneris* in rhizome characters, but blade characters resemble much more closely *A. jordanii*. Pinnulet characters (shape, distal margin) often vary, depending on size of fronds and extent of fertility. (Continued on page 14.)



*Polypodium
hesperium*

Photo left courtesy
HFF website



Dryopteris tokyoensis

Photo right courtesy of
Gloria Reed



**Inniswood Gardens
Shingle Oak and fern bed**

Photo above courtesy of
Gloria Reed

**Inniswood Gardens
athyrium bed**

Photo right courtesy of
Gloria Reed



Pityrogramma triangularis

Photo left courtesy of
Richie Steffen

**Lake Shasta,
California**

Photo right courtesy
of Richie Steffen



Pellaea andromedifolia

Photo right courtesy of
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Adiantum shastense

Photo left courtesy of
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Rare, sterile hybrids showing intermediate morphology are known between *A. aleuticum* and *A. jordanii* (*A. ×tracyi* C.C.Hall ex W.H.Wagner), but no known hybrids are known between other species. In California, and probably elsewhere, the four species have rarely been found growing together. In Shasta Co., *A. aleuticum* and *A. shastense* have so far only once been found growing proximate to one another, but *A. jordanii*, does not co-occur with any of the other species, as far as we have observed.

Acknowledgments

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Inniswood Metro Gardens

HFF Fern Report ~ Fall 2015

Gloria Reed ~ Fern Interest Group Chairperson
Westerville, OH

Inniswood Metro Gardens is a one hundred and twenty acre park once the home of two sisters who enjoyed gardening and observing wildlife. They donated their estate to the Metro Parks for the education and the enjoyment of the public. The relaxing setting provides woodlands, streams, a frog pond, and ten feature gardens to enjoy.

Hardy ferns are displayed throughout the park. All of the ferns distributed by the Hardy Fern Foundation are grown in the Fern Garden along with a collection of native and non-native species which number more than one hundred. In 2010 the entire fern collection was relocated to its present site where the beds are irrigated. The Fern Garden, located beneath the spreading branches of a large Shingle Oak, is enhanced by a backdrop of trees and shrubs. Compost has been used to amend the soil making it neither highly acidic nor alkaline. In the spring, depending on type of fern, each is fertilized with an organic fertilizer or given a small amount of lime to enhance growth. A mulch of composted leaves is applied to the beds which contain woodland ferns. (see photos pg. 12)

The 2012 USDA Plant Hardiness Map placed Inniswood in Zone 6a, however the winters of 2014 and 2015 were much colder than average with extended periods of below zero temperatures, and without the benefit of snow cover, resulted in the loss of many varieties of ferns in the garden. Especially hard hit were the *Cyrtomium* and *Polystichum* Collections which were nearly wiped out. This year the wet and cool weather of spring continued well into mid-summer helping our surviving ferns get off to a strong start. Temperatures for August and September have been mostly in the 80's. Unusual for Central Ohio, highs reaching the low 90 degrees occurred only twice in early August which is normally the hottest month of the summer. While rainfall for the year is above average, we have had little rain since the warmer weather arrived. Cold central Ohio winters and hot dry summers present an intriguing challenge for growing ferns from around the world.

Although Ohio boasts fewer than two dozen native ferns, we currently grow more than one hundred fern varieties thanks to our successful propagation efforts, purchases, and the ferns distributed for testing over the past twenty years by the Hardy Fern Foundation. Our small but dedicated Fern Group Volunteers research and develop methods to improve success with new and interesting ferns.

Some of the consistently high performers in our garden are the *Athyrium niponicum* and *Cyrtomium fortuneii*. Once established many of the *Dryopteris* are very attractive including *Dryopteris erythrosora* 'Brilliance', *Dryopteris goldiana*, and *Dryopteris x australis*. They are able to stand up to the heat and humidity of a midwestern summer and are some of our largest ferns. We are pleased with the *Phyllitis scolopendrium* varieties who seem to thrive among the limestone and tufa rocks.

Plants in the Fern Garden were evaluated in late September 2015 using the following rating system:

- 1 Did not survive
- 2 Poor performance
- 3 Good performance
- 4 Attractive but not thriving
- 5 Best performance

Plant	Planted	Rate	Comments
<i>Adiantum aleuticum</i> ‘Subpumilum’	2011	5	Delicate, lush, and spreading
<i>Athyrium filix-femina</i> ‘Vernoniae Cristata’	1995	1	Failed to emerge after 20 years in garden
<i>Blechnum penna-marina</i>	2013	2	Not growing well, may need to amend soil and plant among rocks
<i>Cheilanthes argentea</i>	2014	1	Did not survive over wintering greenhouse
<i>Cyrtomium fortunei</i>	2003	5	Lush foliage forming large clump of 36" fronds
<i>Cyrtomium lonchitoides</i>	2011	4	24" graceful fronds but crowns have not grown
<i>Cyrtomium falcatum</i> ‘Rochfordianum’	2014	1	Did not survive over wintering in greenhouse
<i>Dryopteris affinis</i> ‘Stableri Crisped’		4	Upright growth with 20" fronds
<i>Dryopteris x australis</i>	2000, 2005	5	36" graceful fronds, spreading, one of largest ferns in garden
<i>Dryopteris bissetiana</i>	1999, 2010	1	Recently lost after many years
<i>Dryopteris clintoniana</i>	2002	3	Average growth
<i>Dryopteris crassirhizoma</i>	2008	2	Barely surviving, may need more light
<i>Dryopteris cycadina</i>	2002	5	Attractive 20" fronds but has not spread
<i>Dryopteris formosana</i>	2006	5	18" fronds, plant spreading

<i>Dryopteris koidzumiana</i>	2012	4	Low growing with shiny 14"
<i>Dryopteris lacera</i> affinity	1999	5	Attractive 20" fronds in modest sized clumps.
<i>Dryopteris polylepis</i>	1999	5	One of the favorites in the garden, lush plants
<i>Dryopteris pseudo-filix-mas</i>	1996, 1997	5	18" fronds, crowns spreading
<i>Dryopteris filix-mas</i> 'Parsley'	2014	5	Attractive 12" fronds on large crowns
<i>Gymnocarpium oyamense</i>	2007	2	Disappeared mid-summer due to dry conditions expect it will return next year
<i>Osmunda regalis</i>		5	36-48" fronds, no fertile fronds, would enjoy wetter conditions
<i>Osmunda regalis</i> 'Cristata'		4	Modest growth, fronds indicating soil too dry
<i>Osmunda regalis</i> 'Decomposita'	2013	4	Low growing with modest mounds
<i>Phyllitis scolopendrium</i>	1995	5	Large attractive plants, 12" fronds
<i>Phyllitis scolopendrium</i> 'Angustifolium'		5	10" shiny deeply serrated fronds, very attractive
<i>Polystichum brauni</i>	2007	1	Didn't survive 2015 winter after many years in garden
<i>Polystichum x dycei</i>	2008, 2010	5	Slow emerging, still producing crosiers
<i>Polystichum setiferum</i> 'Bevis'	2008	1	Didn't survive 2015 winter after many years in garden
<i>Polystichum</i> 'Divisilobum Group'	2006	1	Didn't survive 2015 winter after many years in garden
<i>Pyrossia sheareri</i>	2011	3	Grown in pot and overwintered in green house with modest growth in garden

2016 HFF Spore List

This Spore Exchange is available exclusively to members of the Hardy Fern Foundation. Spore will continue to cost 50 cents per species. However, I have found that it is impossible to know the exact shipping costs until they are actually mailed. For this reason, I would like members who order spore to either request it by mail to: Carolyn Doherty, Director of the Spore Exchange, 1905 43rd St. SE, Puyallup, WA 98372. Or by email to: fernspores@hotmail.com with the address where they will send them. I will fill the order and reply by email with the exact cost of the spore, shipping, and a padded mailer if needed (75 cents) after mailing it. After the member receives this, they can pay for it by return mail at the above address or by PayPal to the Hardy Fern Foundation if it involves foreign currency. Hopefully, this will improve our system and eliminate shipping cost guessing.

Also, I would like to thank donors of spore who take the extra time to package the spore in individual packages. Please try to avoid using tape as spore sticks to it. Individual packaging saves me an enormous amount of time repackaging and labeling the spore when orders come in.

NAME - YEAR - DONOR

Adiantum aleuticum '15 Doherty

Adiantum aleuticum 'Subpumilum' '11, '14 RSF; '12 Duryee; '13 RAS

Adiantum aleuticum 'Imbricatum' '12 Duryee

Adiantum thalictroides '15 RSF

Adiantum trapeziforme '15 Beuving

Arachniodes affinis simulans '13 EMBG

Arachniodes simplicior '11 Charleston, SC, USA

Arachniodes simplicior 'Variegata' '11 RSF

Asplenium trichomanes '11 Taylor

Athyrium sp. '13 Gassner

Athyrium sp. – narrow, red-stemmed '12 Gassner

Athyrium atkinsonii '13 Gassner

Athyrium attenuatum '13 Gassner

Athyrium clivicola '13 Gassner

Athyrium filix-femina ‘Bornholmiense’ '12 Duryee

Athyrium filix-femina ‘Frizelliae’ '11 RSF

Athyrium niponicum ‘Pictum’ '11 RSF

Athyrium otophorum '14 Doherty

Athyrium yokoscense var. *alpicola* '13 Gassner

Blechnum hastatum '15 Beuving

Blechnum niponicum '14 RSF; '15 Beuving

Blechnum novae-zelandiae '13 Doherty

Blechnum spicant '14 Doherty, RSF

Blechnum spicant ‘Rickard’s Serrate’ '14 RSF

Cryptogramma sp. '11 Duryee

Cyrtomium lonchitoides '11, '15 RSF; '15 JKL

Cyrtomium macrophyllum '11, '14, '15 RSF

Cyrtomium macrophyllum var. *tukusicola* '11 RSF

Dryopteris aemula '12 Gassner

Dryopteris affinis ‘Stableri’ '15 RSF

Dryopteris affinis ‘Stableri Crisped’ '15 RSF

Dryopteris bissetiana '11 RSF

Dryopteris carthusiana ‘Cristata’ '14 Perasso

Dryopteris cashmiriana '15 RSF

Dryopteris championii '12, '14 RSF

Dryopteris chrysocoma '13 Gassner

Dryopteris clintoniana '12 Gassner

Dryopteris corleyi '12 Gassner

Dryopteris crassirhizoma '11, '13, '15 RSF

Dryopteris crispifolia '15 RSF

Dryopteris cycadina '15 RSF

Dryopteris decipiens '10 RSF

Dryopteris erythrosora '11 Riehl

Dryopteris expansa '12 Perasso

Dryopteris expansa var. *willeana* '12 Gassner

Dryopteris filix-mas '15 RSF

Dryopteris filix-mas 'Barnesii' '14 RSF

Dryopteris formosana '15 Beuving

Dryopteris intermedia '11 Rickard - Natural Bridge, KY, USA

Dryopteris lepidopoda '15 RSF

Dryopteris marginalis '11, '13 RSF

Dryopteris muenchii '12 Gassner

Dryopteris polylepis '12 Olsen; '15 RSF

Dryopteris pseudoflix-mas '15 RSF

Dryopteris remota '15 RSF

Dryopteris sacrosancta '11 RSF

Dryopteris sieboldii '13, '14 RSF

Dryopteris sublacerata '11, '13, '15 RSF

Dryopteris wallichiana '11 Duryee; '13 RSF

Matteuccia intermedia unknown unknown

Matteuccia orientalis '14 Olsen

Onychium japonicum '13 Olsen; '14 Doherty

Pellaea atropurpurea '15 Beuving

Phyllitis scolopendrium '11 Doherty

Phyllitis scolopendrium 'Cristata' '11 EMBG

Polypodium glycyrrhiza '11 Doherty

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Polystichum aculeatum Cristata Group '13 EMBG

Polystichum californicum '11, '15 RSF

Polystichum deltodon '13 Gassner

Polystichum makinoi '11, '14 RSF

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Polystichum munitum '11 Doherty

Polystichum neolobatum '11, '14 RSF

Polystichum retroso-paleaceum '08, '10 RSF

Polystichum rigens '15 RSF

Polystichum setiferum 'Lineare' '12 Olsen

Polystichum tripterion '15 Beuving

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Polystichum wilsonii '12 Gassner

Polystichum xiphophyllum '08, '15 RSF

Pteris cretica 'Albo-lineata' '11 Doherty

Pteris wallichiana '15 Beuving

Woodsia intermedia '15 RSF

Woodwardia unigemmata '12 Mandeville

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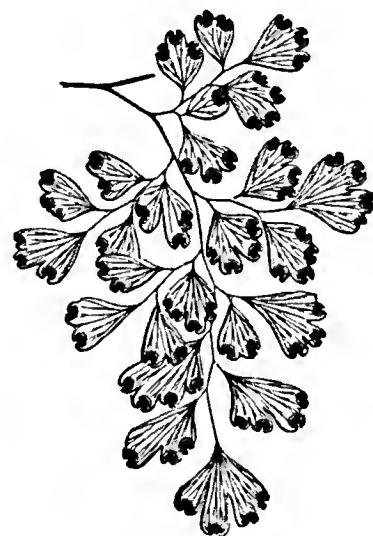
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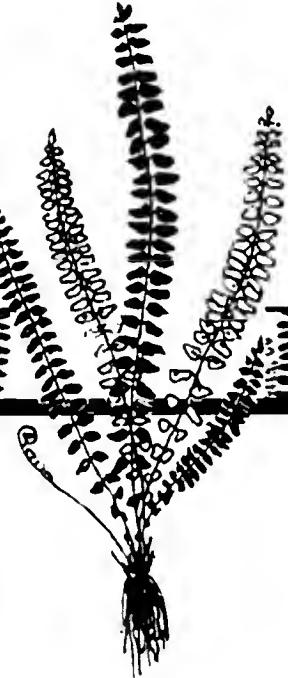
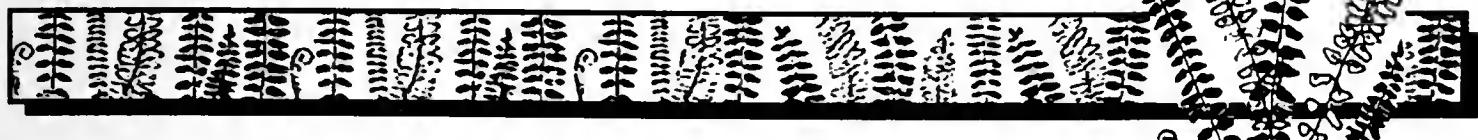
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